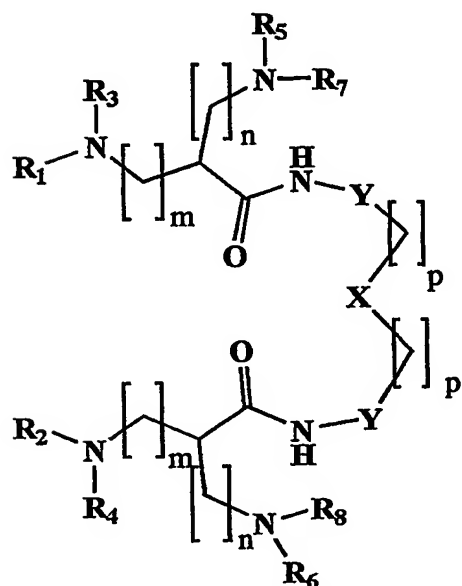


Claims

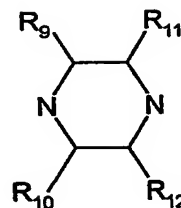
1. A diaminoacid-polyamine:peptide based gemini compound having a diaminoacid-polyamine or a diaminoacid-aminoacid-polyamine backbone and
- 5 conforming to the general structure of formula (I):



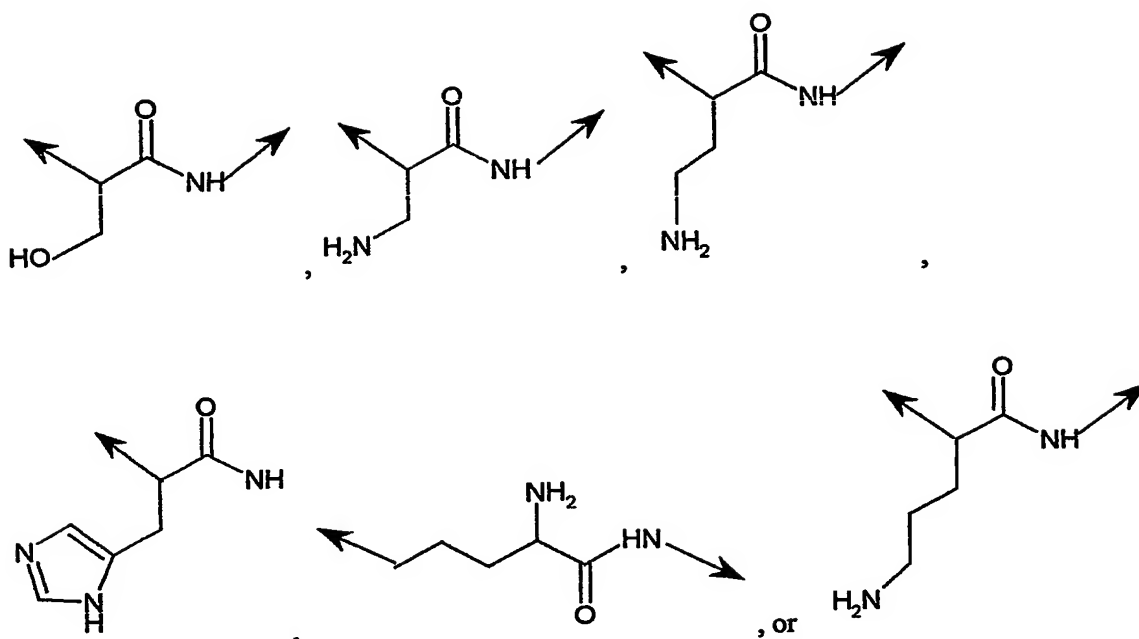
(I)

where:

- 10 $m = 0$ to 6 ;
 $n = 0$ to 7 ;
 $p = 0$ to 6 ; and where

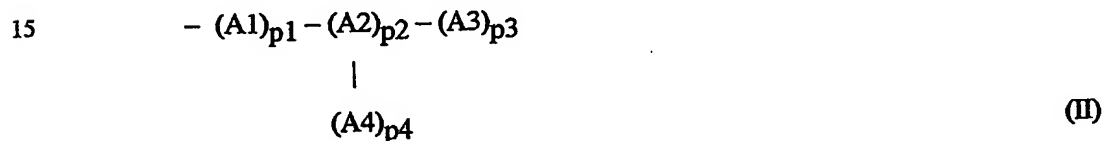


- 15 $X =$ a bond, CH_2 , $(\text{CH}_2)_2$, $\text{NH}(\text{CH}_2)_q\text{NH}$ where $q = 2$ to 6 , or where R_9 to R_{12} , which can be the same or different, are selected from H, O or $\text{C}_r\text{H}_{2r+1}$, where $r = 0$ to 6 with the proviso that when R_9 and R_{12} are O, or when R_9 and R_{11} are O, then R_{10} and R_{11} or R_{10} and R_{12} , respectively, are H; and where
- 20 $Y =$ a bond, CH_2 .



5 and where R₃, R₄, R₅, R₆, R₇ and R₈ are hydrogen and R₁ and R₂ are saturated or unsaturated hydrocarboxyl groups having up to 24 carbon atoms and linked to the diaminoacid-polyamine backbone by an amide bond; or

10 where R₃, R₄, R₅ and R₆ are hydrogen, R₁ and R₂ are saturated or unsaturated hydrocarboxyl groups having up to 24 carbon atoms and linked to the diaminoacid-polyamine backbone by an amide bond, and where R₇ and R₈, which may be the same or different, are peptide groups formed from one or more amino acids linked together by amide (CONH) bonds and further linked to the diaminoacid-polyamine backbone by amide bonds, in a linear or branched manner, having the general formula (II):



20 where the values for p₁ and p₂, which may be the same or different, are from 0 to 5, preferably 1; and the values for p₃ and p₄, which may be the same or different, are from 0 to 5, preferably 0; A₁, A₃ and A₄, which may be the same or different, is an amino acid selected from serine, lysine, ornithine, threonine, histidine, cysteine, arginine and tyrosine; and A₂ is an amino acid selected from lysine, ornithine and histidine;

or

a pharmaceutically acceptable salt thereof..

2. A compound according to claim 1 that is symmetrical, that is R_1 and R_2 are the same as each other,
5 R_3 and R_4 are the same as each other, R_5 and R_6 are the same as each other, R_7 and R_8 are the same as each other.

3. A compound according to claims 1 or 2 wherein A1 is lysine, serine or threonine, and A3 and A4 are lysine, ornithine, histidine or arginine.

10

4. A compound according to any of claims 1 to 3 wherein the hydrocarboxyl group is selected from:

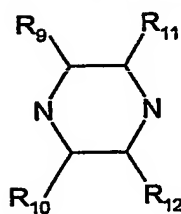
-C(O)(CH₂)₁₀CH₃
 -C(O)(CH₂)₁₂CH₃
 -C(O)(CH₂)₁₄CH₃
 -C(O)(CH₂)₁₆CH₃
 -C(O)(CH₂)₁₈CH₃
 -C(O)(CH₂)₂₀CH₃
 -C(O)(CH₂)₇CH=CH(CH₂)₅CH₃ natural mixture
 -C(O)(CH₂)₇CH=CH(CH₂)₇CH₃ natural mixture
 -C(O)(CH₂)₇CH=CH(CH₂)₅CH₃ Cis
 -C(O)(CH₂)₇CH=CH(CH₂)₇CH₃ Cis
 -C(O)(CH₂)₇CH=CH(CH₂)₅CH₃ Trans
 -C(O)(CH₂)₇CH=CH(CH₂)₇CH₃ Trans
 -C(O)(CH₂)₇CH=CHCH₂CH=CH(CH₂)₄CH₃
 -C(O)(CH₂)₇(CH=CHCH₂)₃CH₃
 -C(O)(CH₂)₃CH=CH(CH₂CH=CH)₃(CH₂)₄CH₃
 -C(O)(CH₂)₇CHCH(CH₂)₇CH₃
 -C(O)CHCHOH(CH₂)₂CH₃
 or
 -C(O)(CH₂)₂₂CH₃.

15

5. A compound according to any one of claims 1 to 4 where m is 0, n is 2 to 4, X is (CH₂) or (CH₂)₂, Y is a bond and p is 0 to 4.

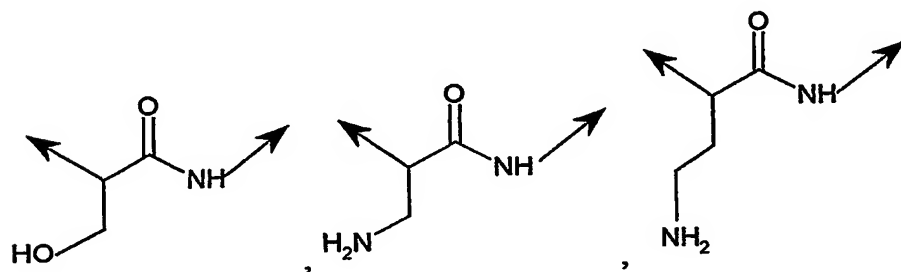
6. A compound according to any one of claims 1 to 4 where m is 0, n is 2 to 4, X is
 20 NH(CH₂)_qNH, where q is 2 to 5, Y is a bond and p is 2 to 5.

7. A compound according to any one of claims 1 to 4 where m is 0, n is 2 to 4, X is

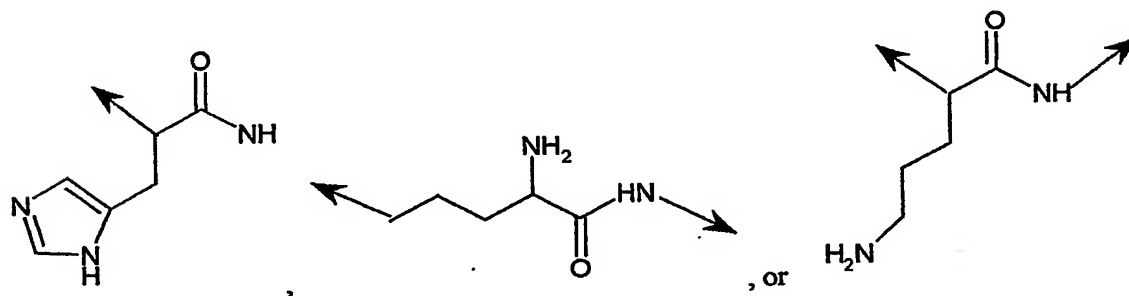


, where R_9 , R_{10} , R_{11} and R_{12} are all H, Y is a bond and p is 2 to 5.

- 5 8. A compound according to any one of claims 1 to 4 where m is 0, n is 2 to 4, X is (CH_2) or $(CH_2)_2$, p is 0 to 4 and Y is

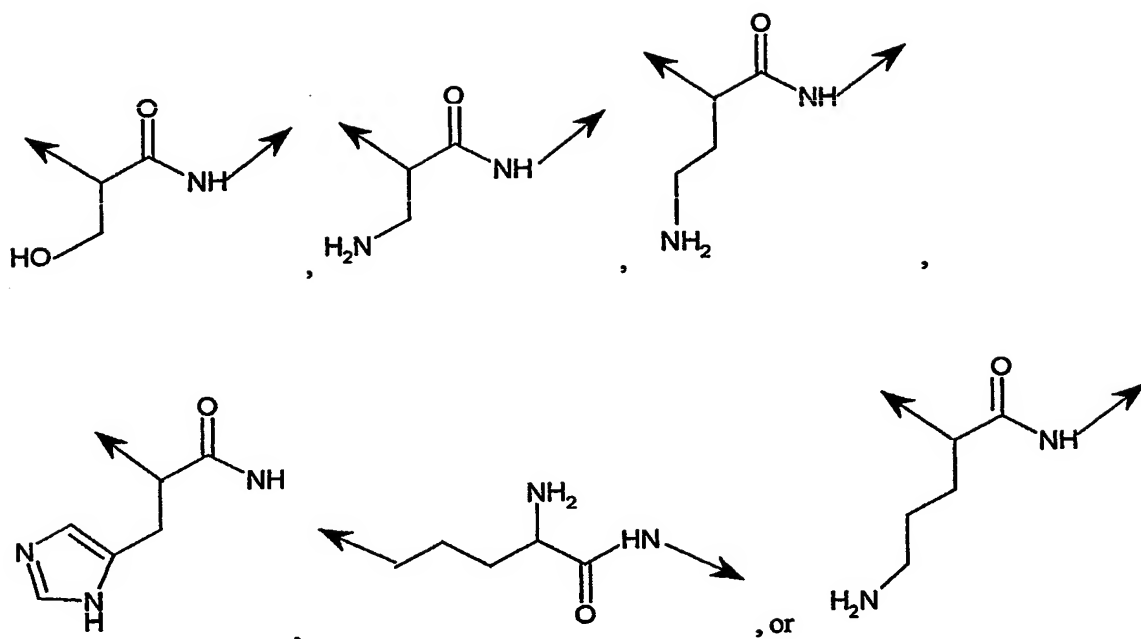


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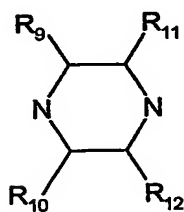


9. A compound according to any one of claims 1 to 4 where m is 0, n is 2 to 4, X is $NH(CH_2)_qNH$, where q is 2 to 5, p is 2 to 5 and Y is

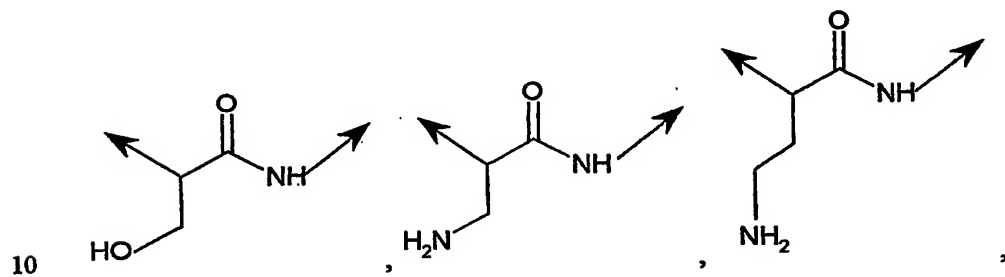
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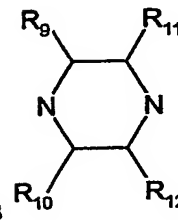
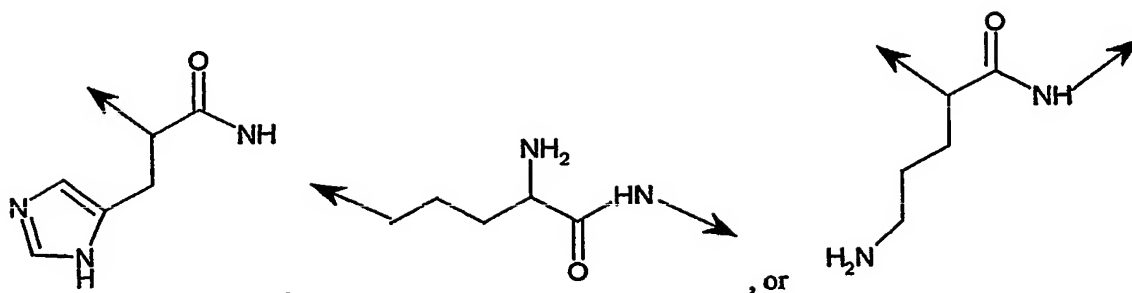


- 5
10. A compound according to any one of claims 1 to 4 where m is 0, n is 2 to 4, X is



, where R_9 , R_{10} , R_{11} and R_{12} are all H, p is 2 to 5 and Y is

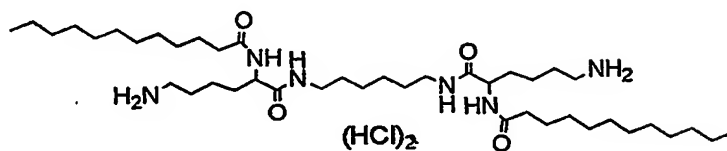




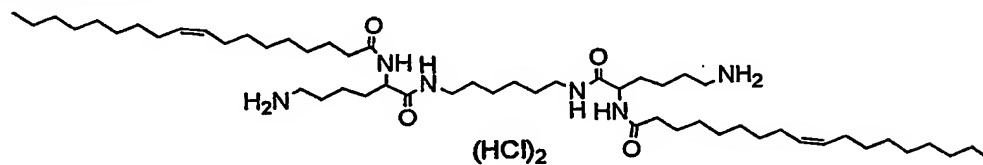
11. A compound according to any one of claims 1 to 4 where X is 1 to 6 and n is 1 to 7.

5

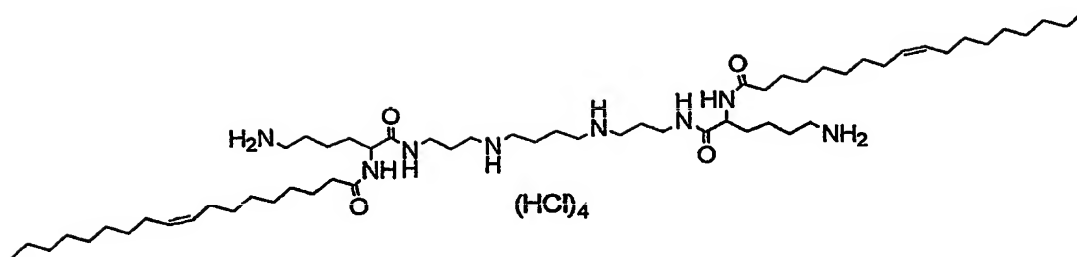
12. The compound GSN 11 of formula:



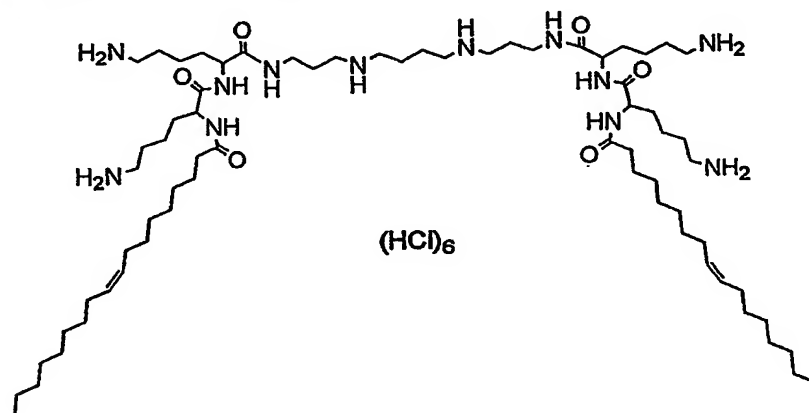
- 10 13. The compound GSN 14 of formula:



14. The compound GSC 102 of formula:

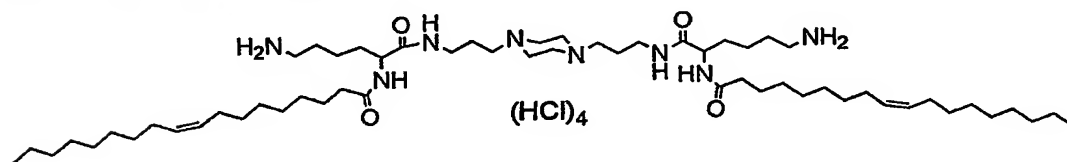


15. The compound GSC 157 of formula:



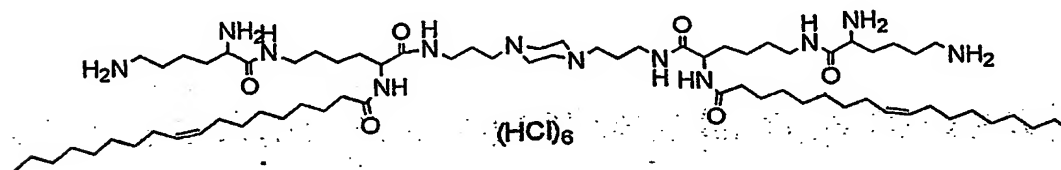
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16. The compound GSC170 of formula:

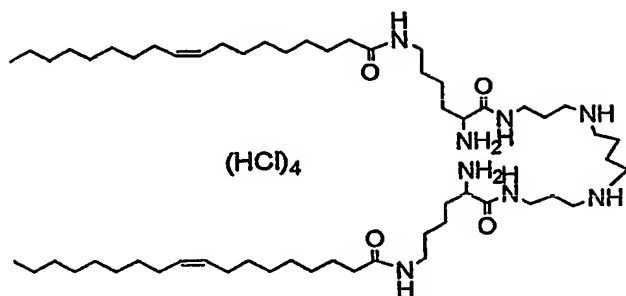


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17. The compound GSC 184 of formula:



- 15 18. The compound GSC101 of formula:



19. The use of a diaminoacid-polyamine:peptide-based gemini compound as defined in any one of claims 1 to 18 in enabling transfection of DNA or RNA or analogues thereof into a eukaryotic or prokaryotic cell *in vivo* or *in vitro*.

20. The use of a diaminoacid-polyamine:peptide-based gemini compound according to claim 19 wherein the compound is used in combination with one or more supplements selected from the group consisting of:
 (i) a neutral carrier; or
 (ii) a complexing reagent.

21. The use according to claim 20 wherein the neutral carrier is dioleoyl phosphatidylethanolamine (DOPE).

22. The use according to claim 20 wherein the complexing reagent is PLUS reagent.

23. The use according to claim 20 wherein the complexing reagent is a peptide comprising mainly basic amino acids.

24. The use according to claim 23 wherein the peptide consists of basic amino acids.

25. The use according to claim 23 or 24 wherein the basic amino acids are selected from lysine and arginine.

26. The use according to claim 23 wherein the peptide is polylysine or polyornithine.

27. A method of transfecting polynucleotides into cells *in vivo* for gene therapy, which method comprises administering diaminoacid-polyamine:peptide-based gemini compounds of any one of claims 1 to 18

together with, or separately from, the gene therapy vector.

28. The use of a diaminoacid-polyamine-based gemini compound of any one of claims 1 to 18 to facilitate the transfer of a polynucleotide or an anti-infective compounds into prokaryotic or eukaryotic organism for use in anti-infective therapy.
29. The use of a diaminoacid-polyamine-based gemini compound of any one of claims 1 to 18 to facilitate the adhesion of cells in culture to each other or to a solid or semi-solid surface.
30. A process for preparing diaminoacid-polyamine-based gemini compounds of claim 1 which process comprises the coupling of a succinimide ester of a diaminoacid linked to its α or terminal amino group to an hydrocarboxyl chain to a polyamine linker using potassium carbonate as a base in a mixture of tetrahydrofuran and water as solvents.